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Inventor: Robert F. Bishop, Jr.
Atty. Docket No. 1177-021 NP
Atty. Joseph B. Milstein, Ph.D.
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PRIOR ART

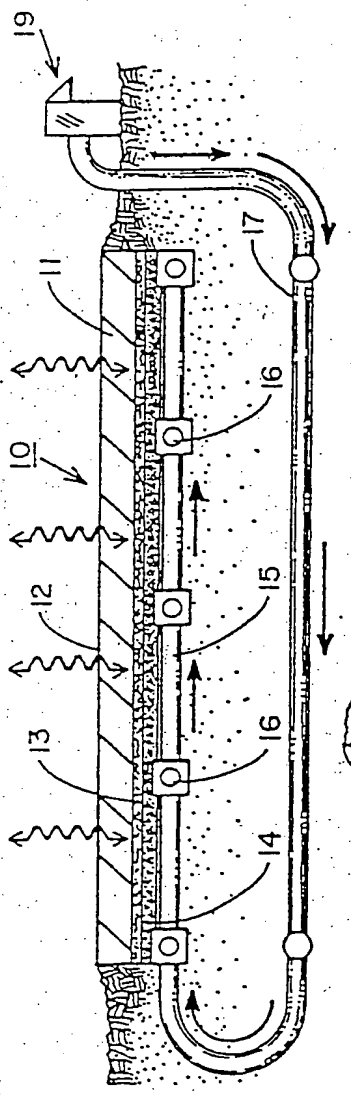

FIG. 1

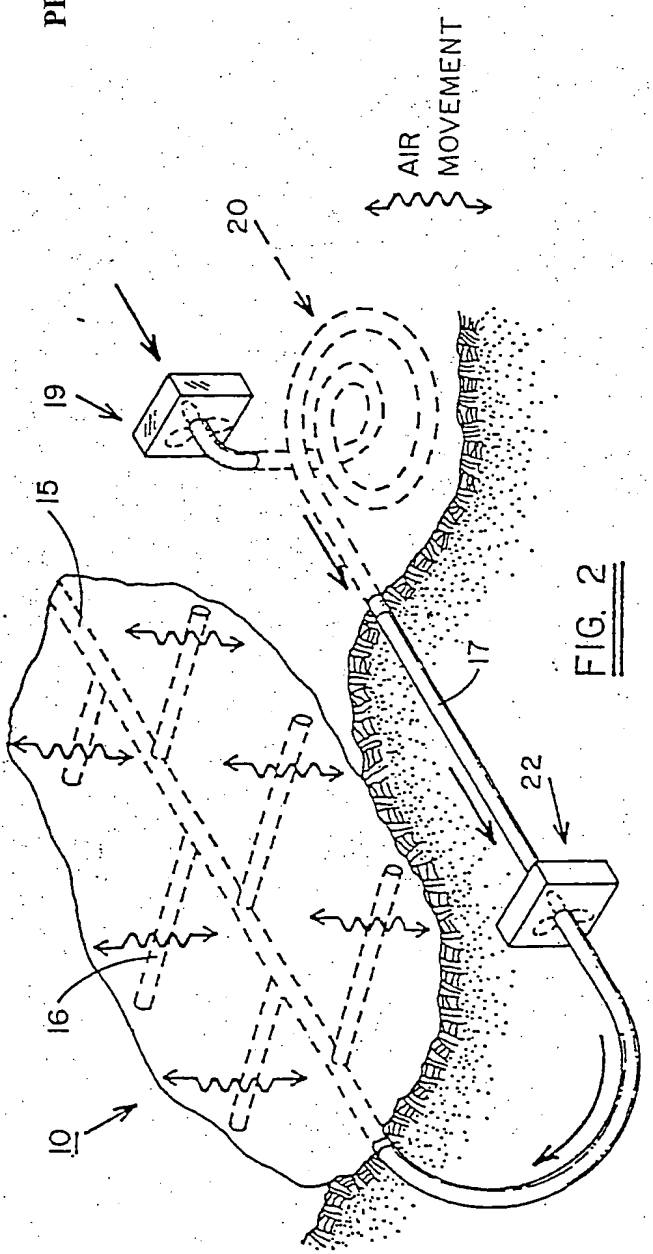

FIG. 2

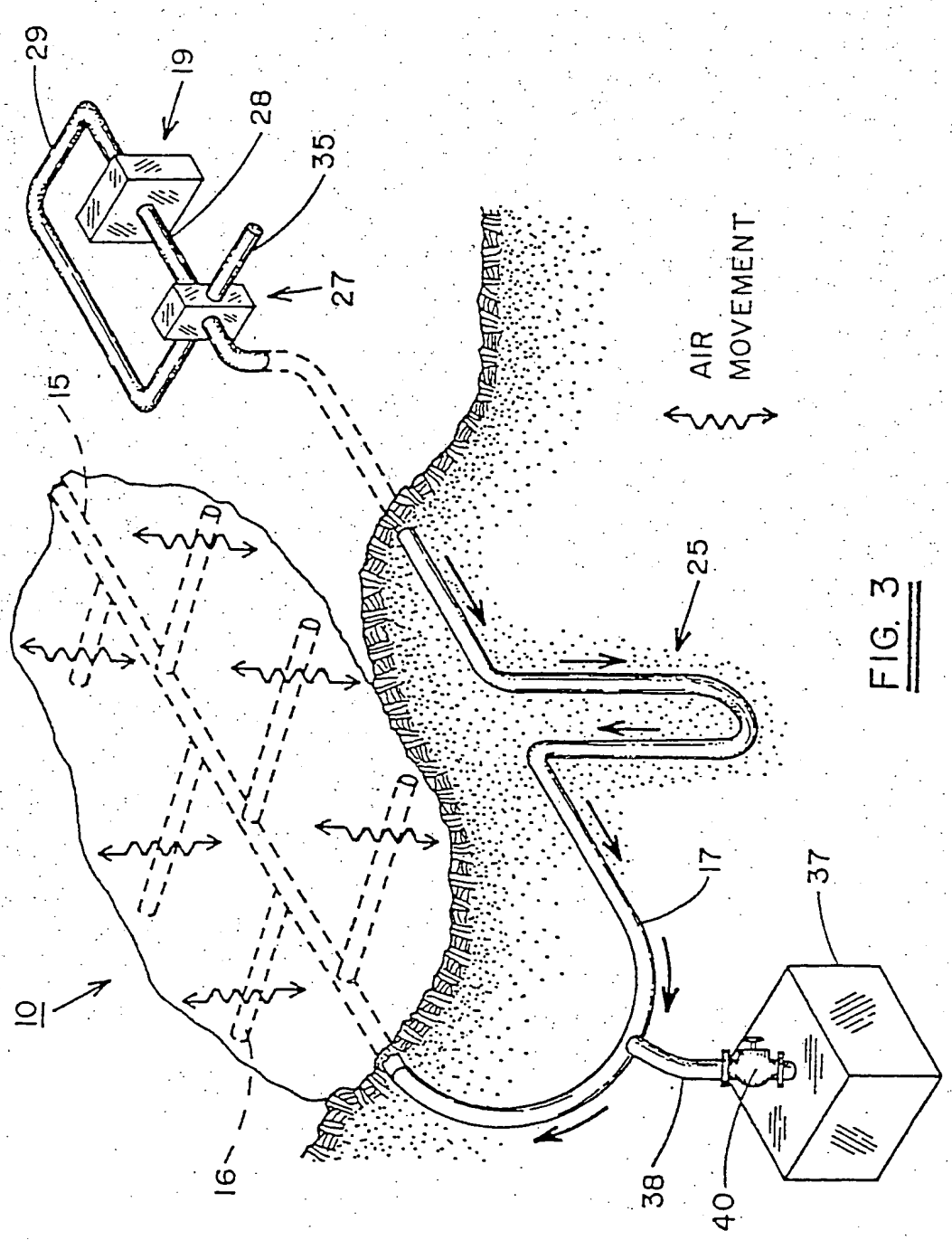

FIG. 3

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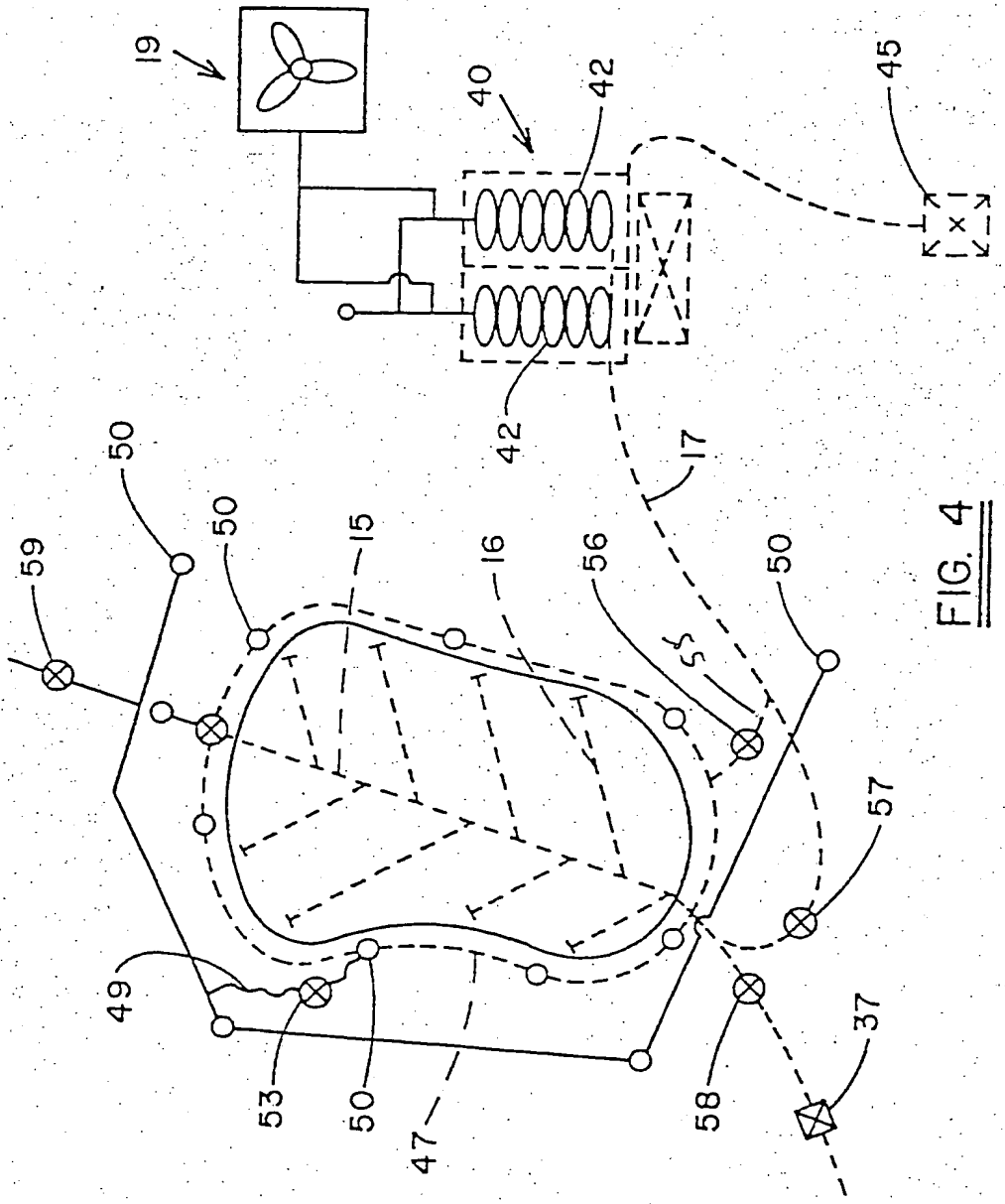

FIG. 4
PRIOR ART

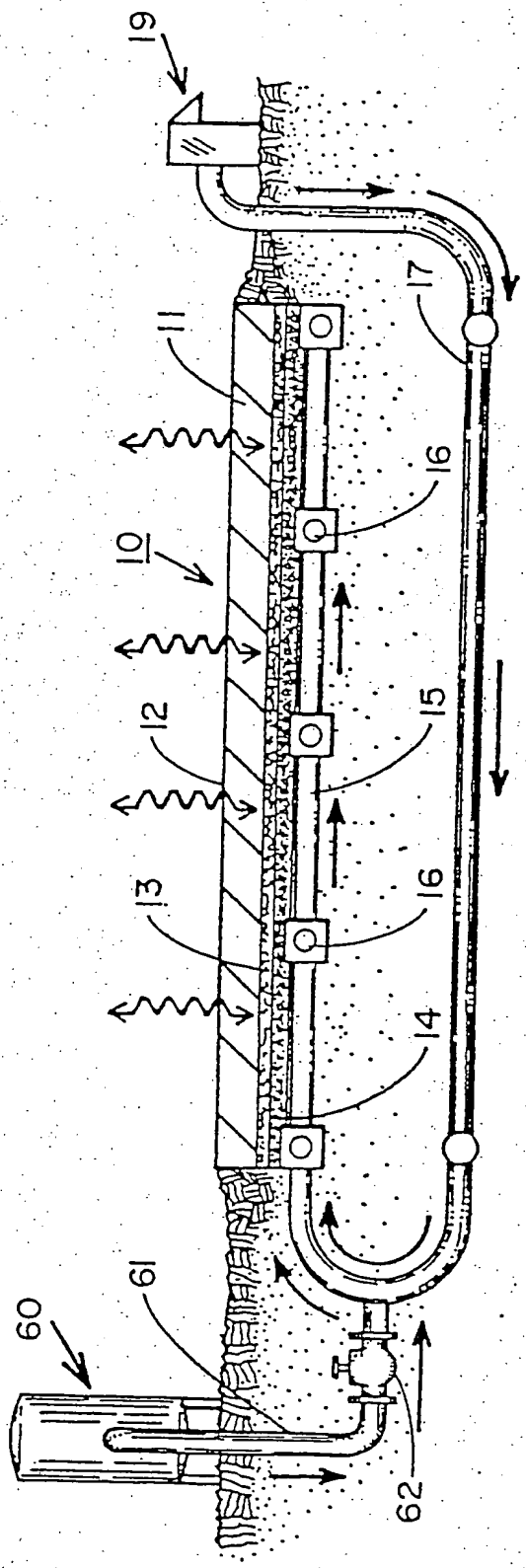

FIG. 5

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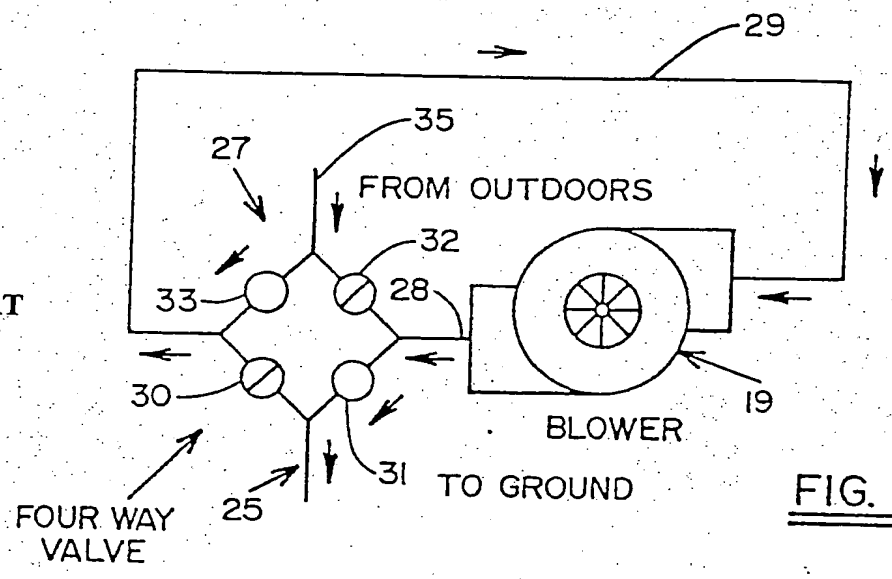

FIG. 6

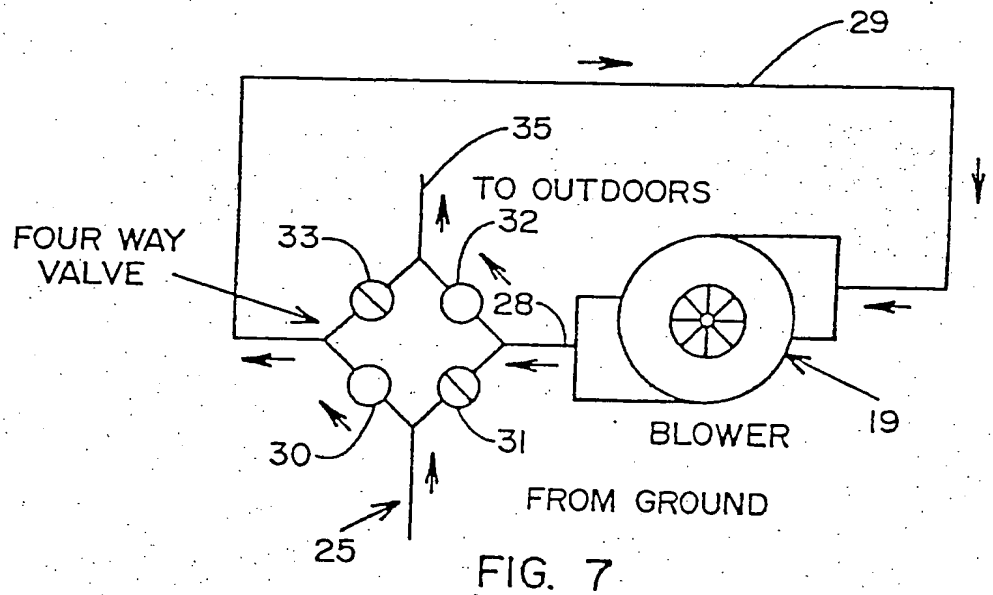

FIG. 7

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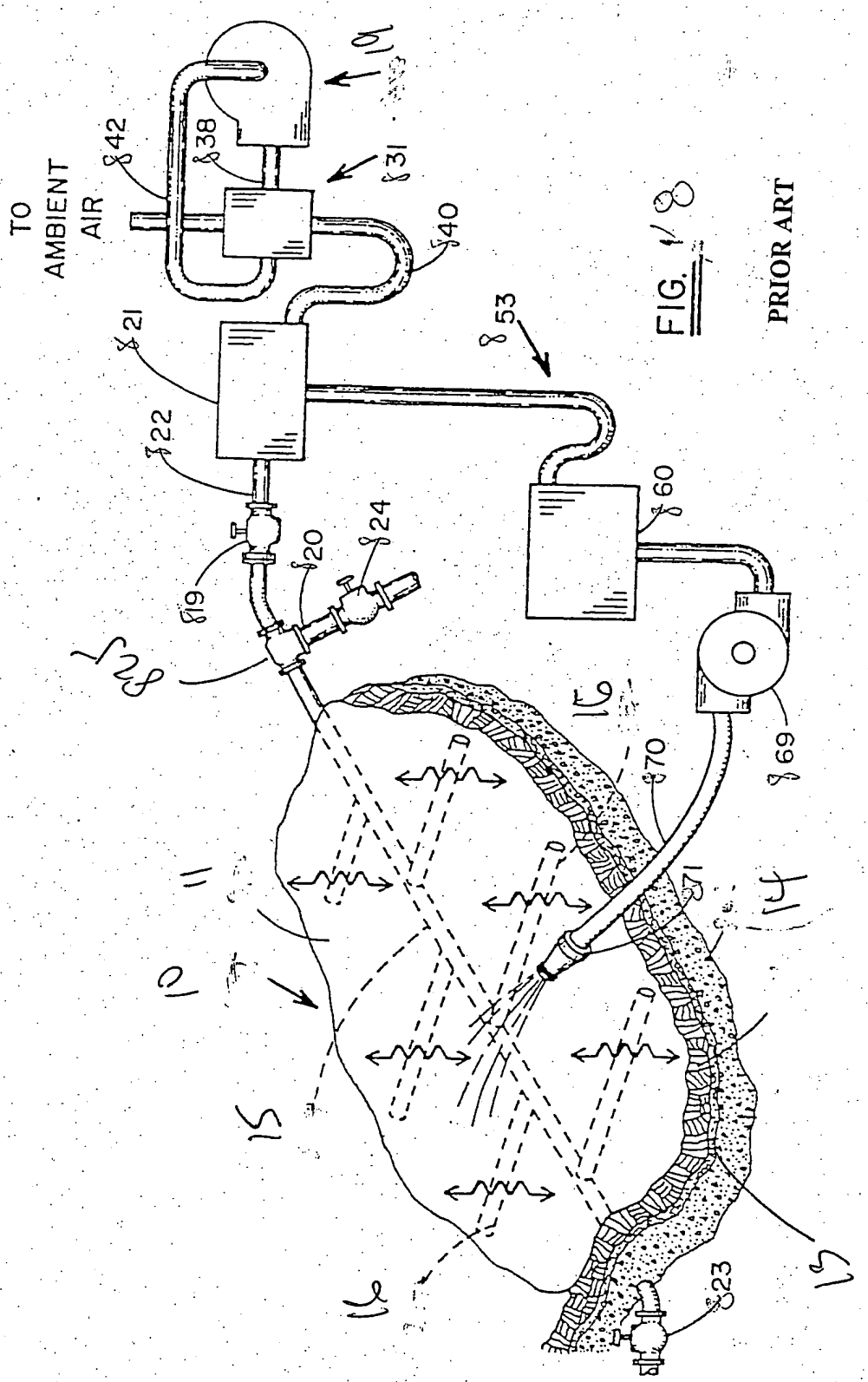

FIG. 1/8
PRIOR ART

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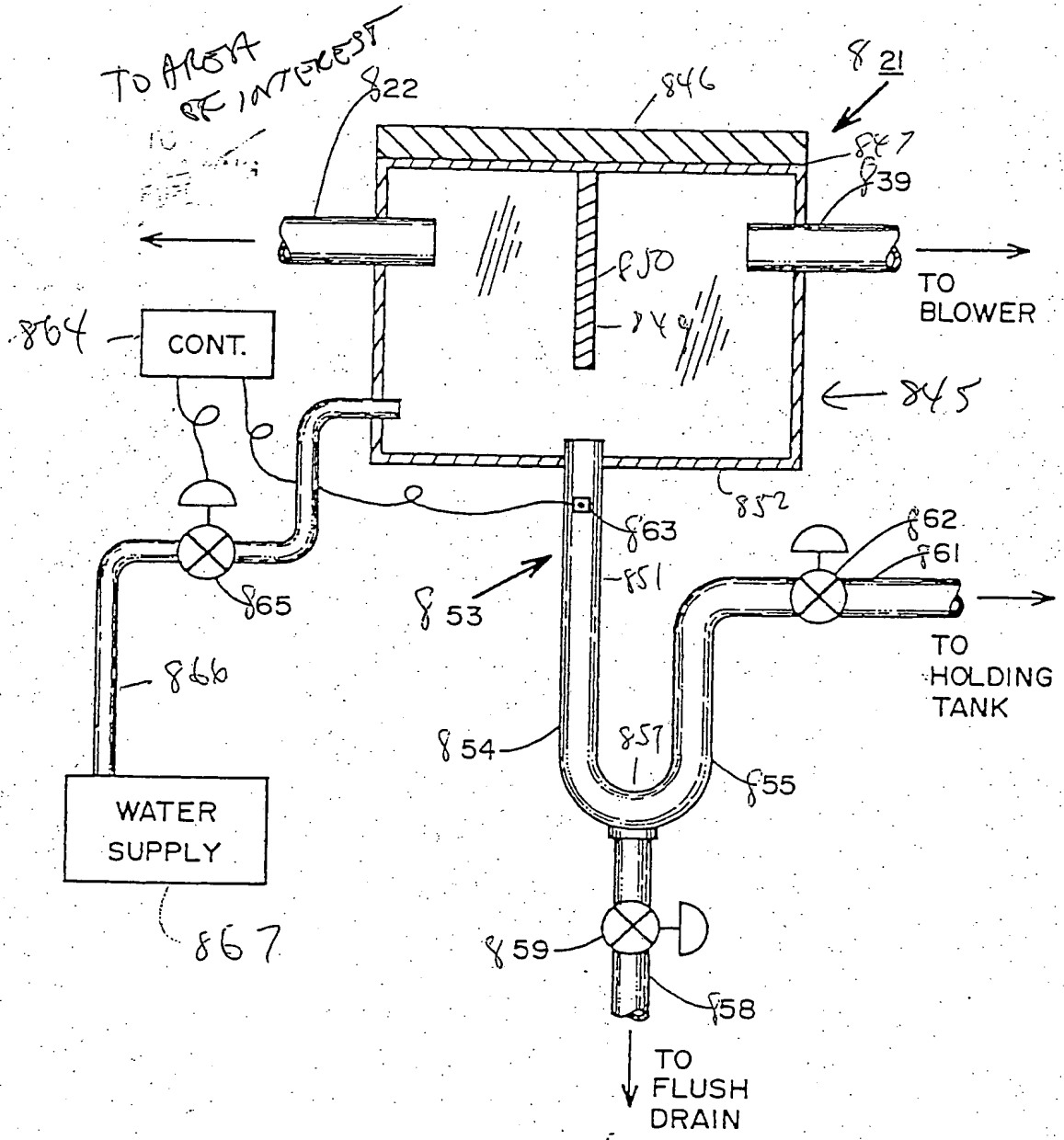

FIG. 9

PRIOR ART

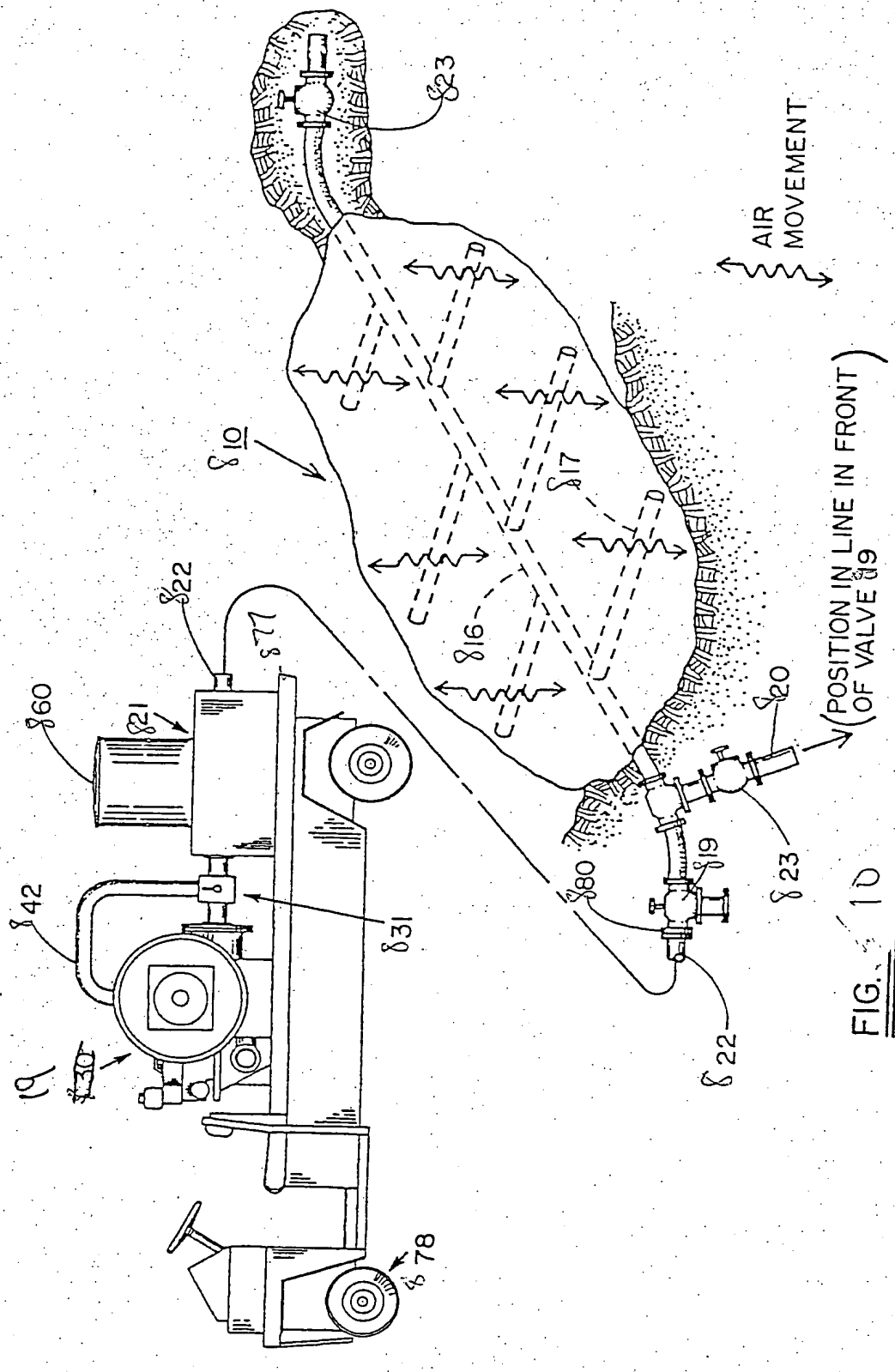

FIG. 1D

PRIOR ART

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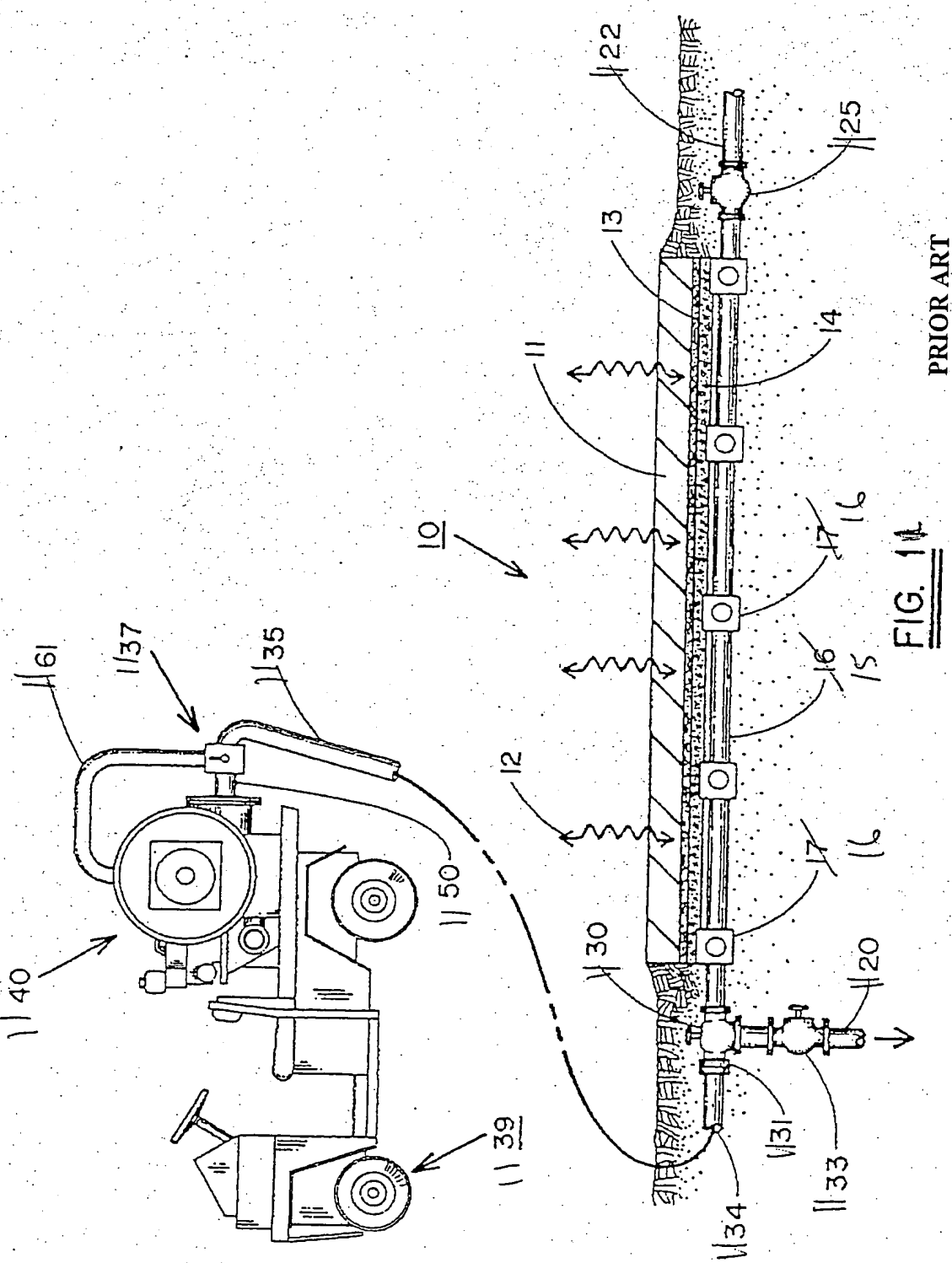
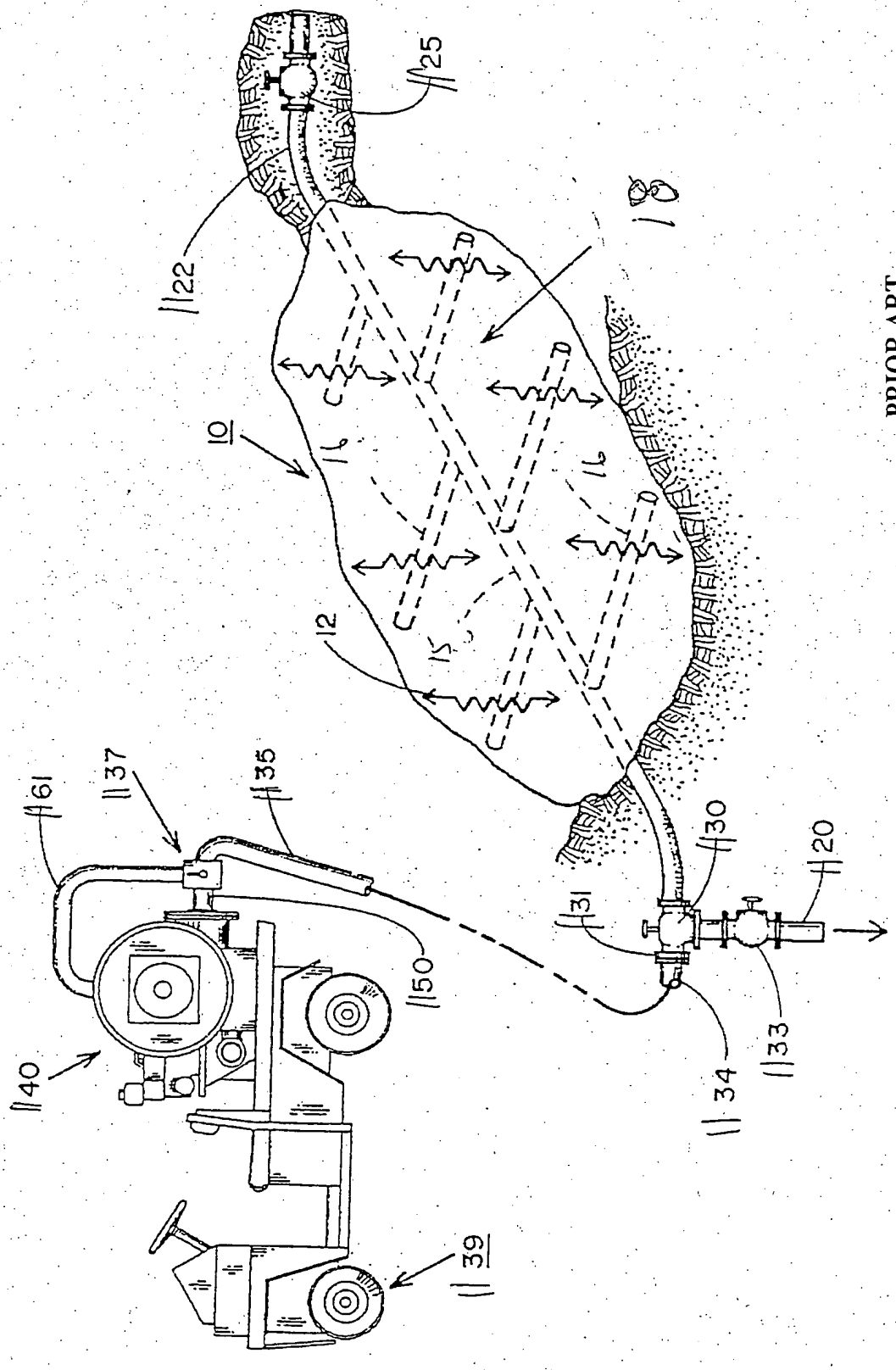


FIG. 1A

PRIOR ART



PRIOR ART

FIG. 12

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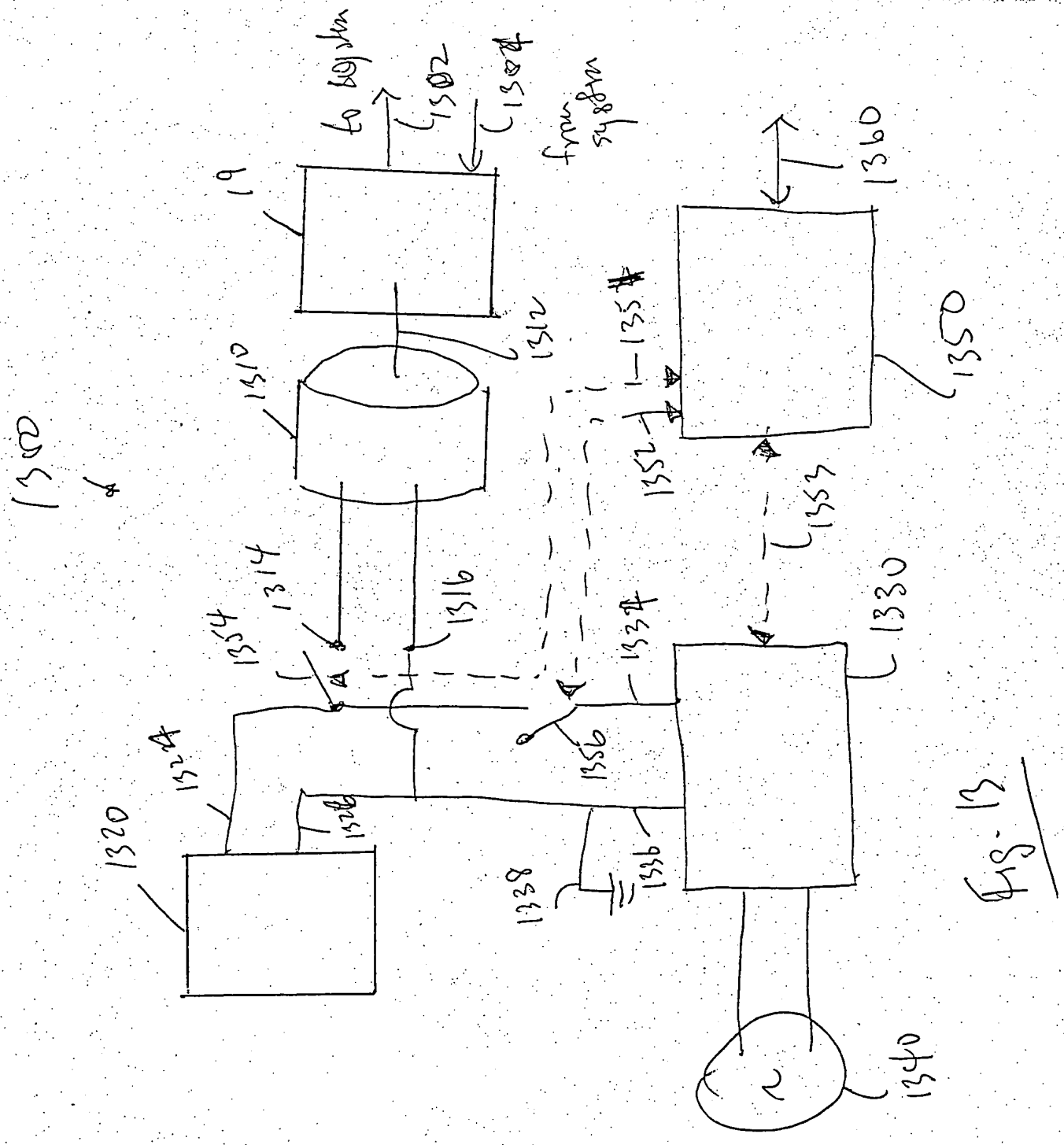

Fig. 13

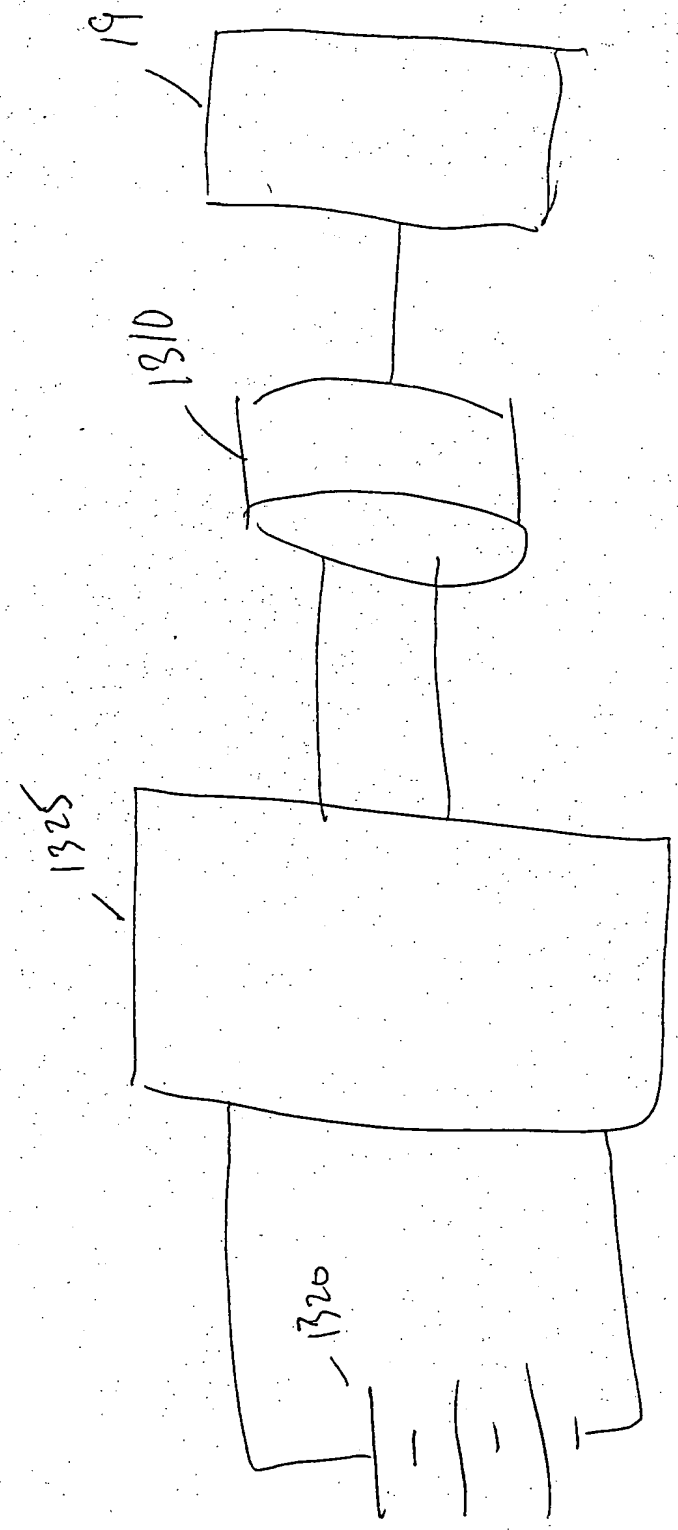

FIG. 13A

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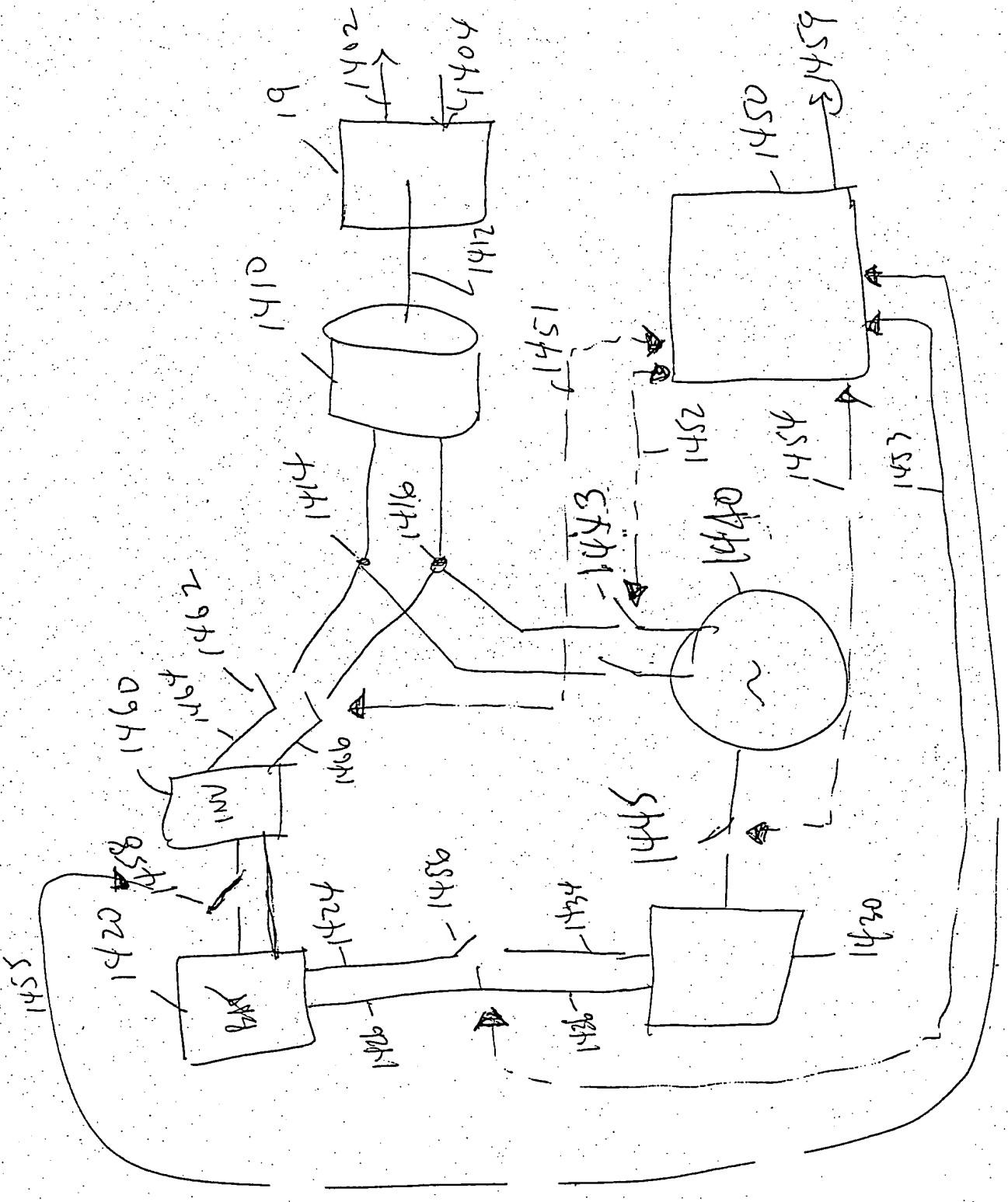


Fig. 14

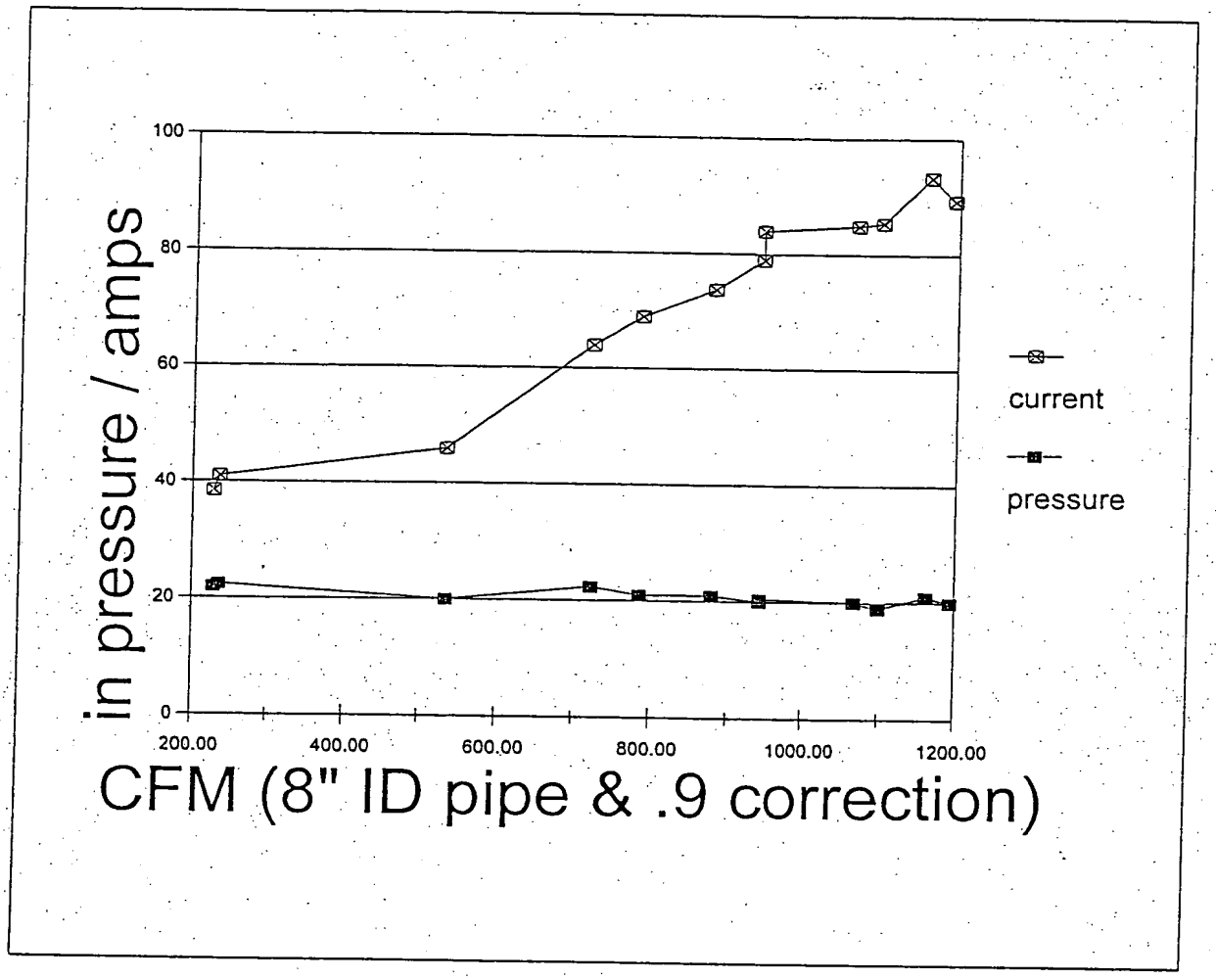
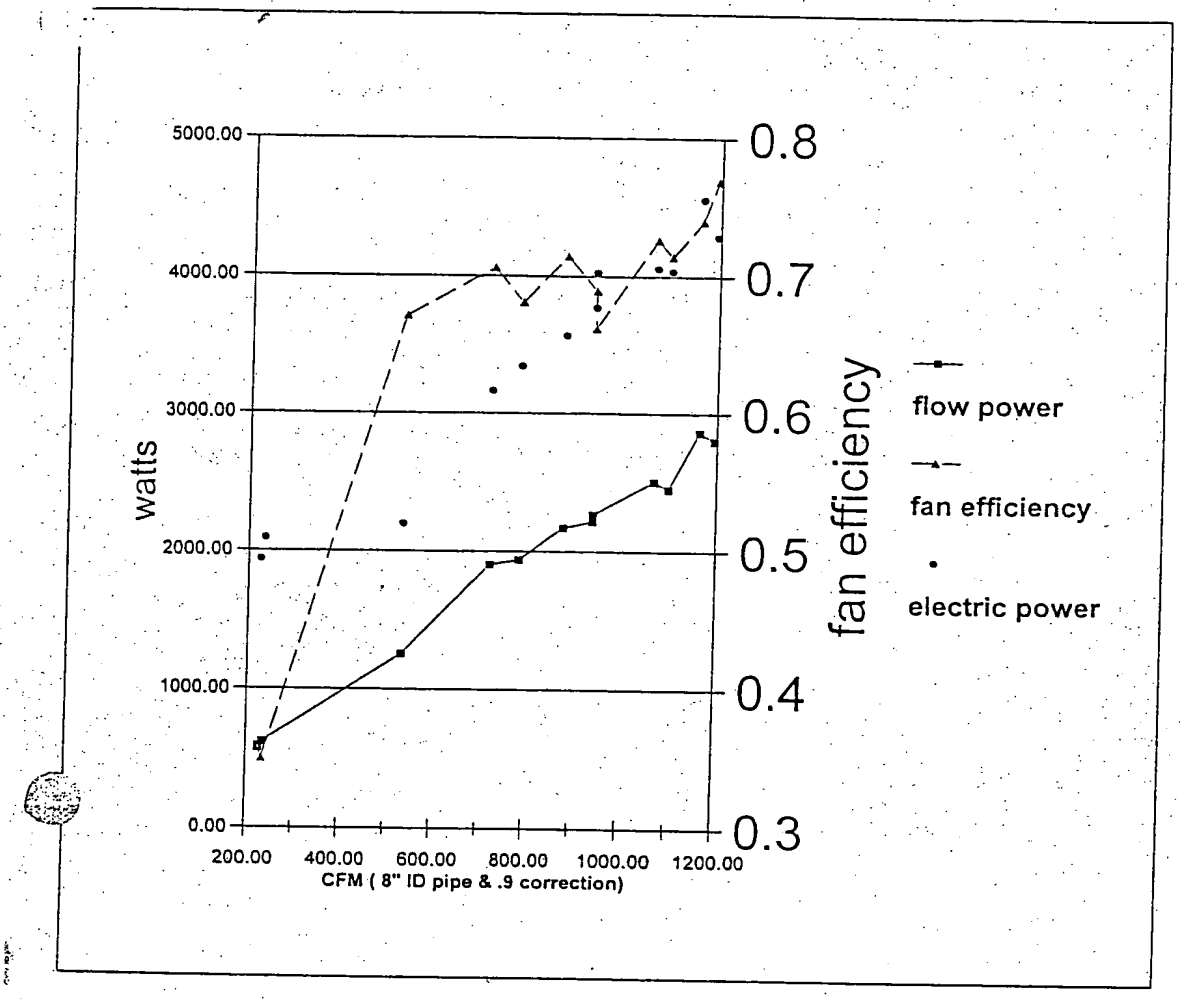

100
80
60
40
20
0
in pressure / amps
200.00
400.00
600.00
800.00
1000.00
1200.00
CFM (8" ID pipe & .9 correction)
current
pressure

Fig. 15


5000.00
4000.00
3000.00
2000.00
1000.00
0.00
watts
0.8
0.7
0.6
0.5
0.4
0.3
fan efficiency
200.00
400.00
600.00
800.00
1000.00
1200.00
CFM (8" ID pipe & .9 correction)
flow power
fan efficiency
electric power

Fig, 16

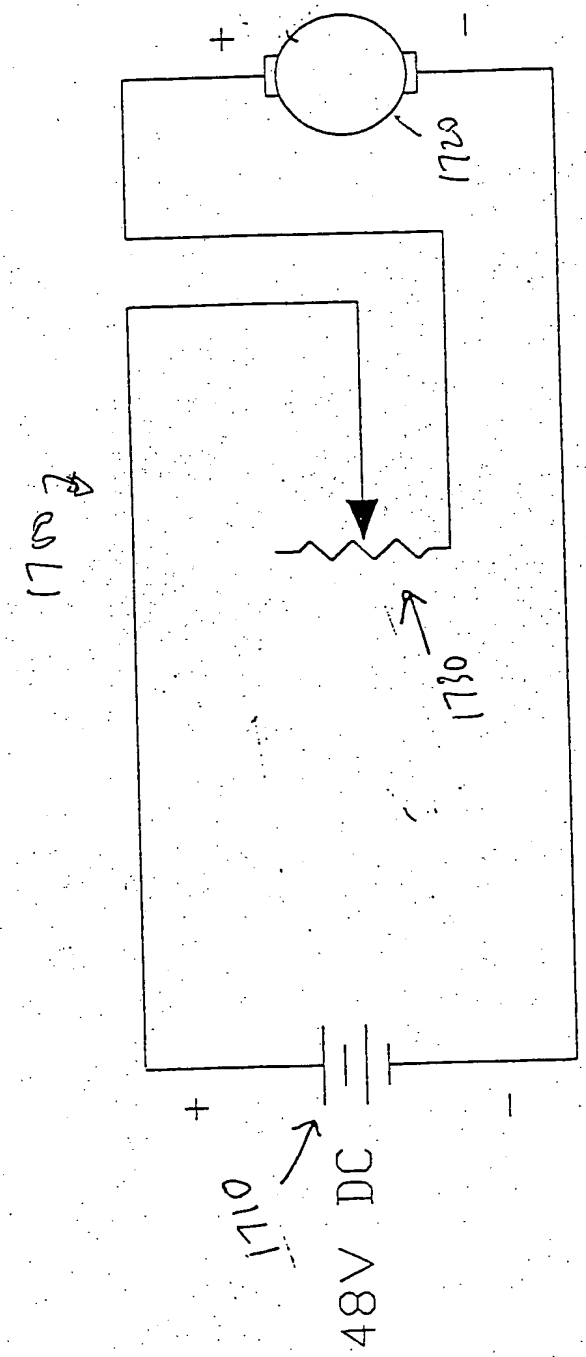


Fig. 17

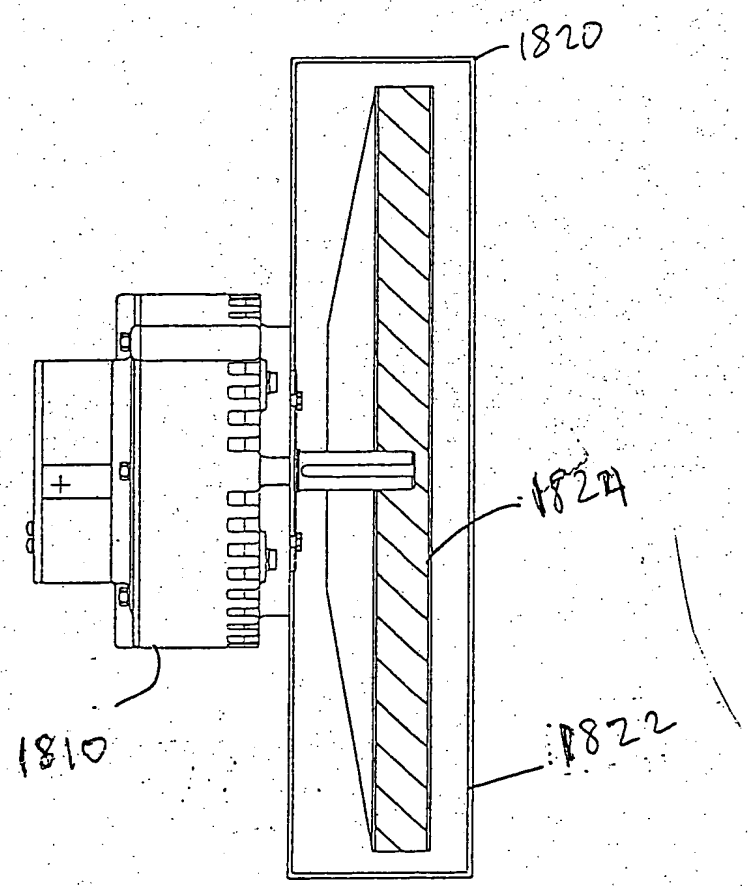


Fig. 18

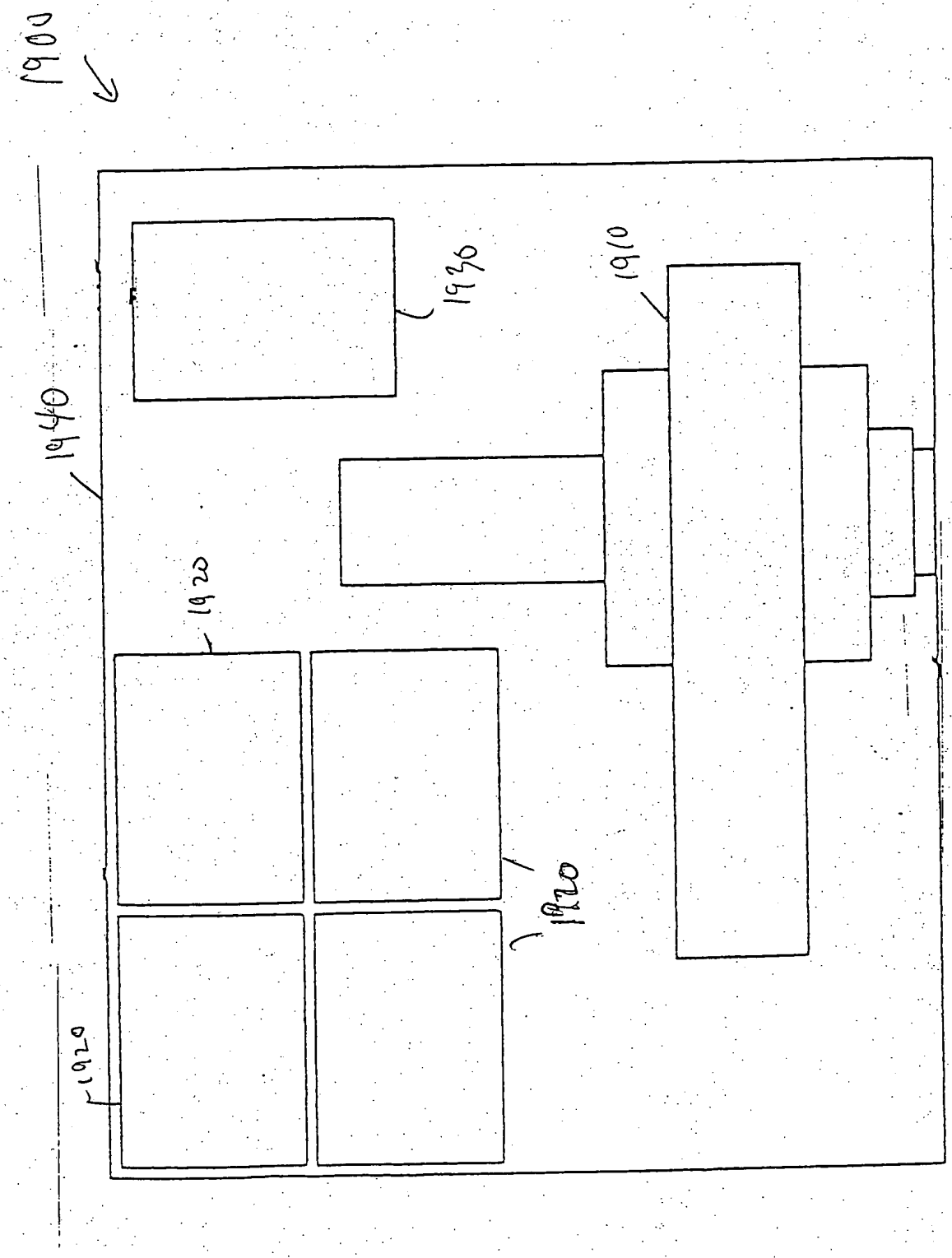


Fig. 19

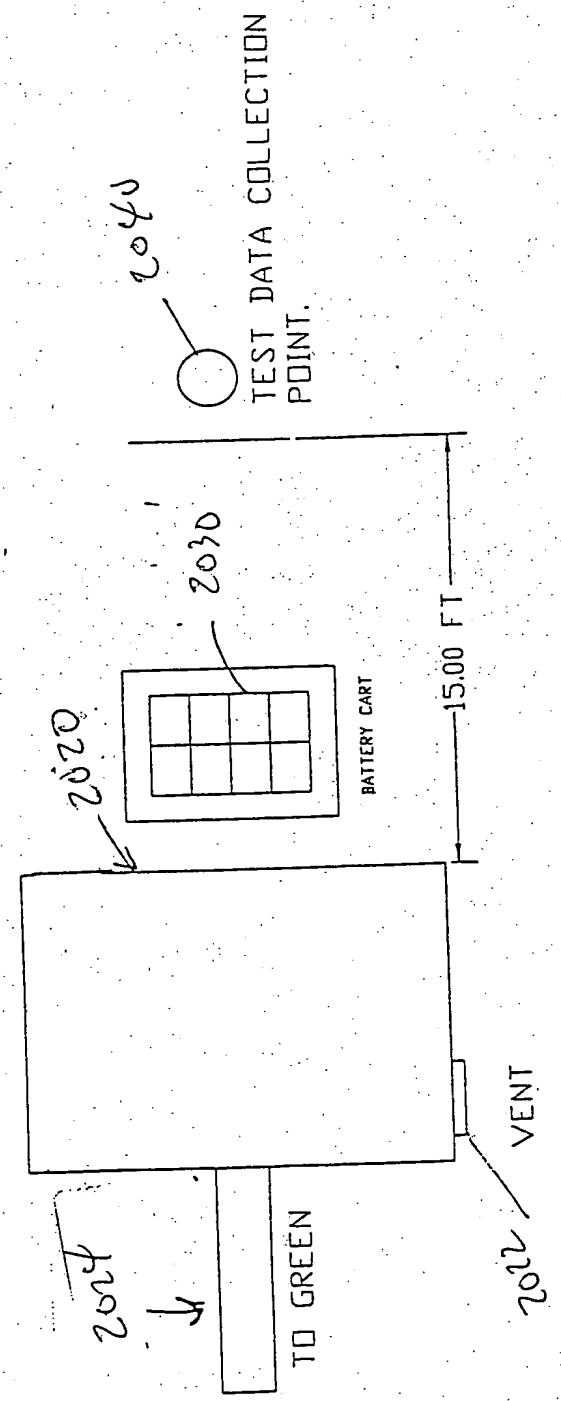

2040
TEST DATA COLLECTION POINT.
2030
2020
BATTERY CART
15.00 FT
2024
TO GREEN
2022
VENT

FIG. 2

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Fig. 21 **PRIOR ART**

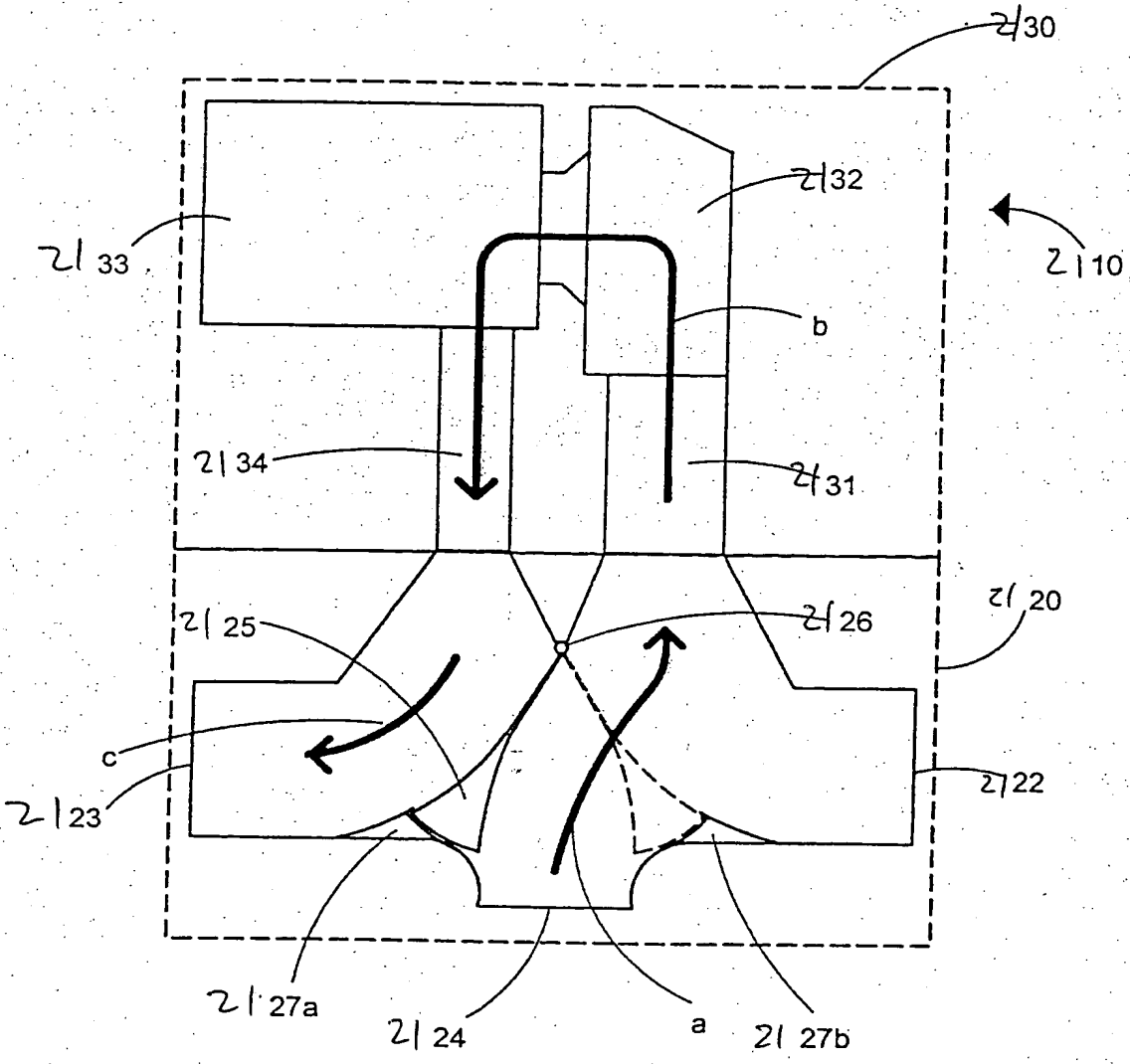

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Fig. 2Z **PRIOR ART**

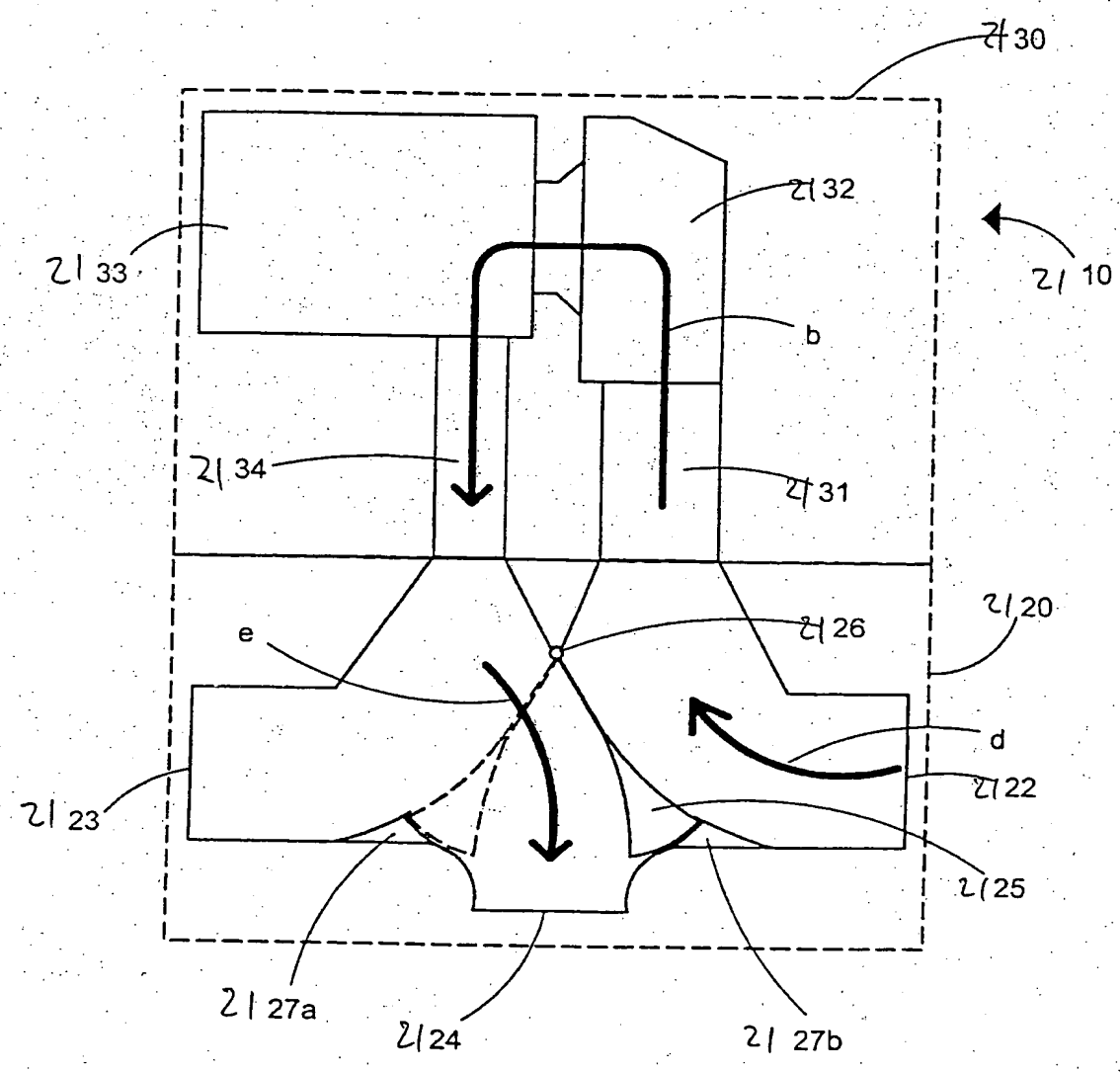
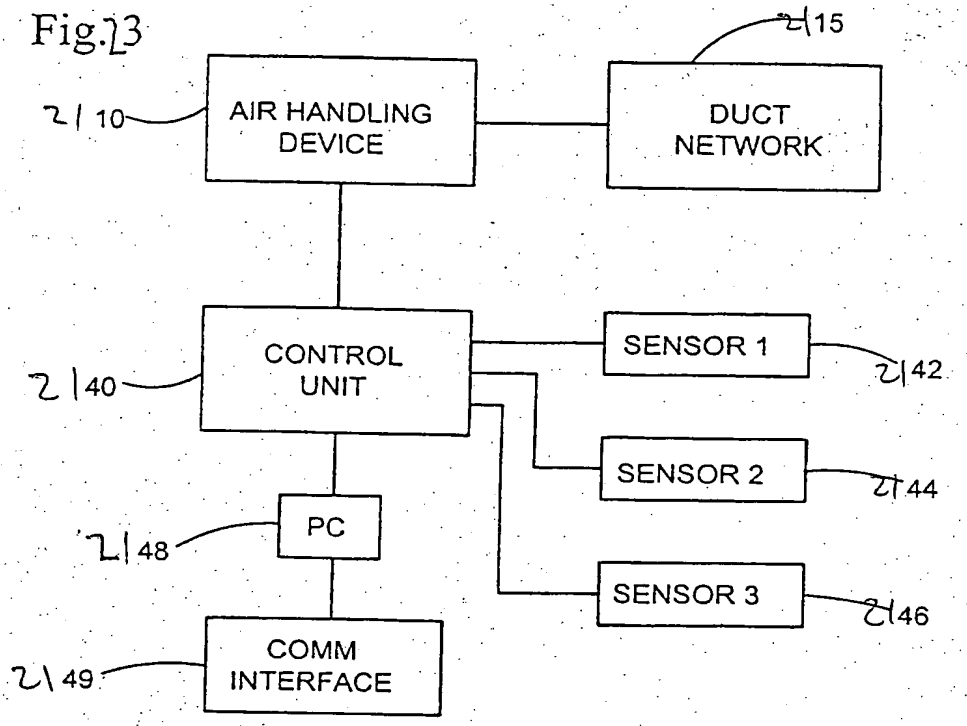


Fig. 3



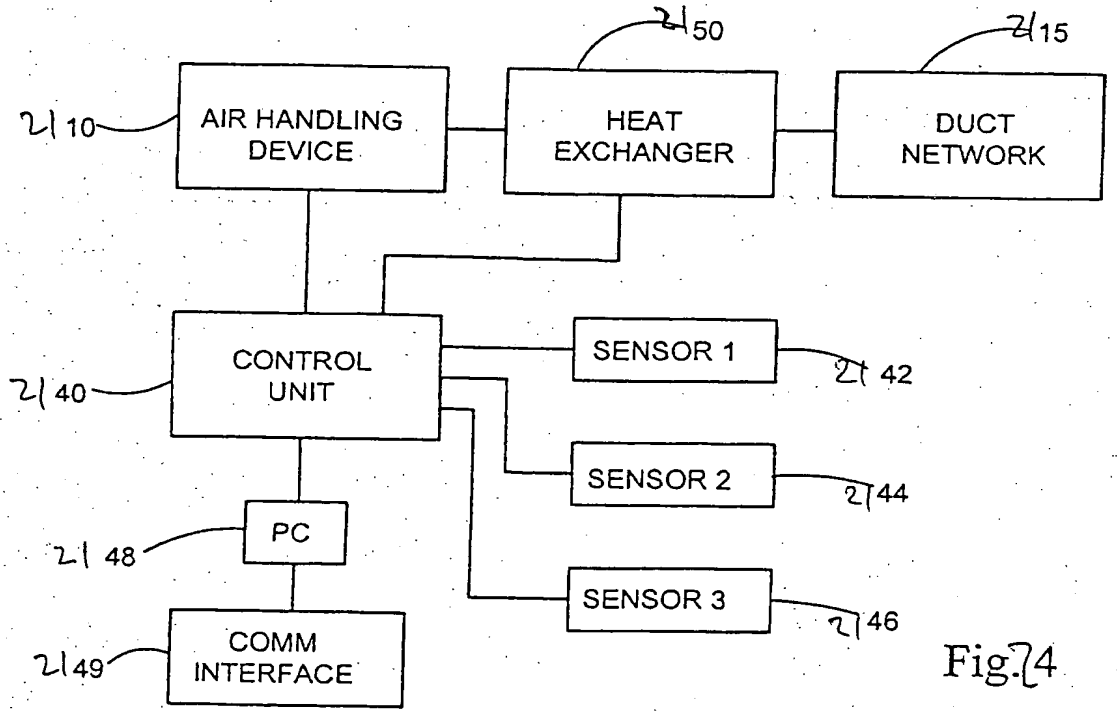


Fig. 4

PRIOR ART

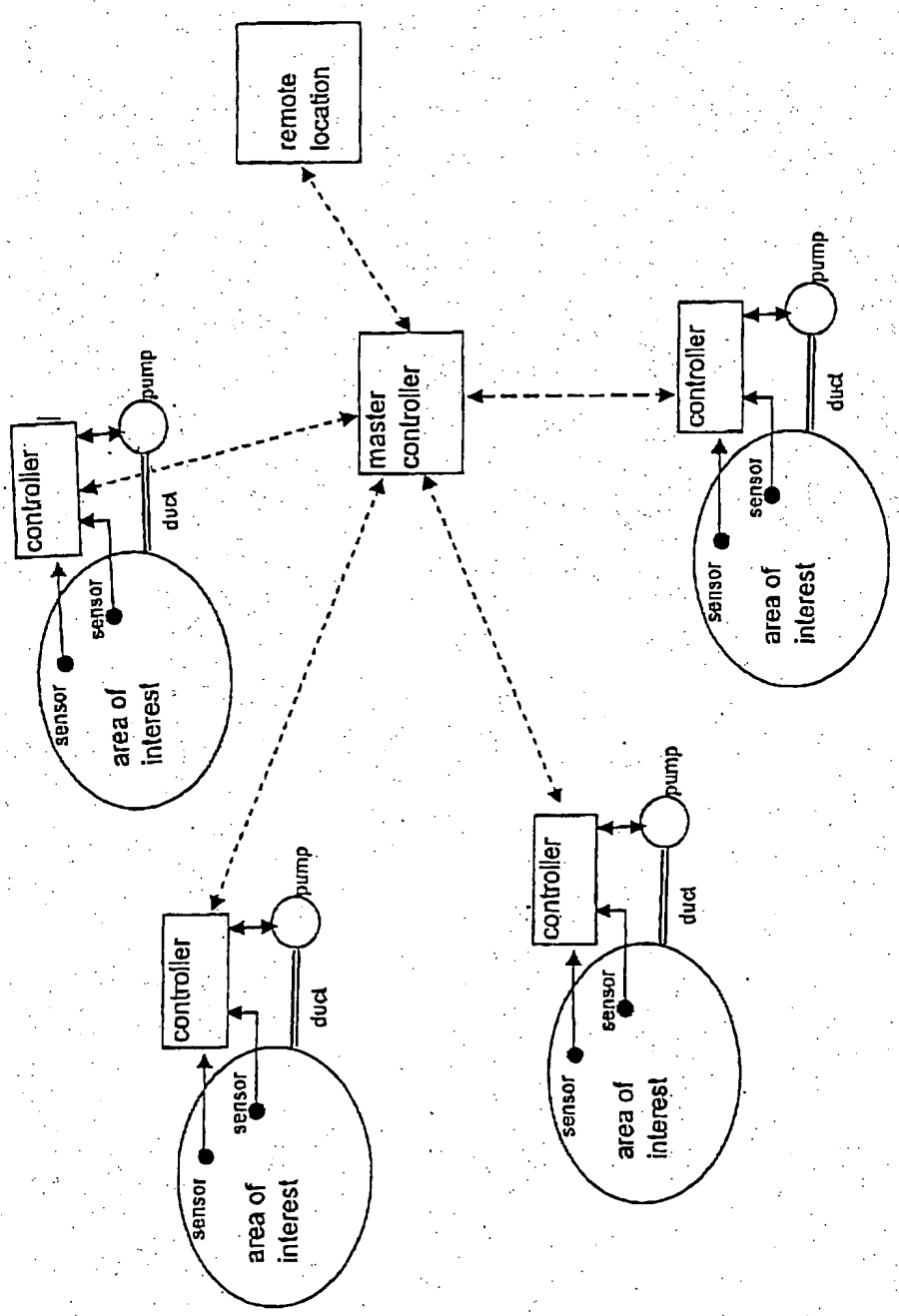

remote location
master controller
controller
pump
duct
sensor
area of interest

FIGURE 25

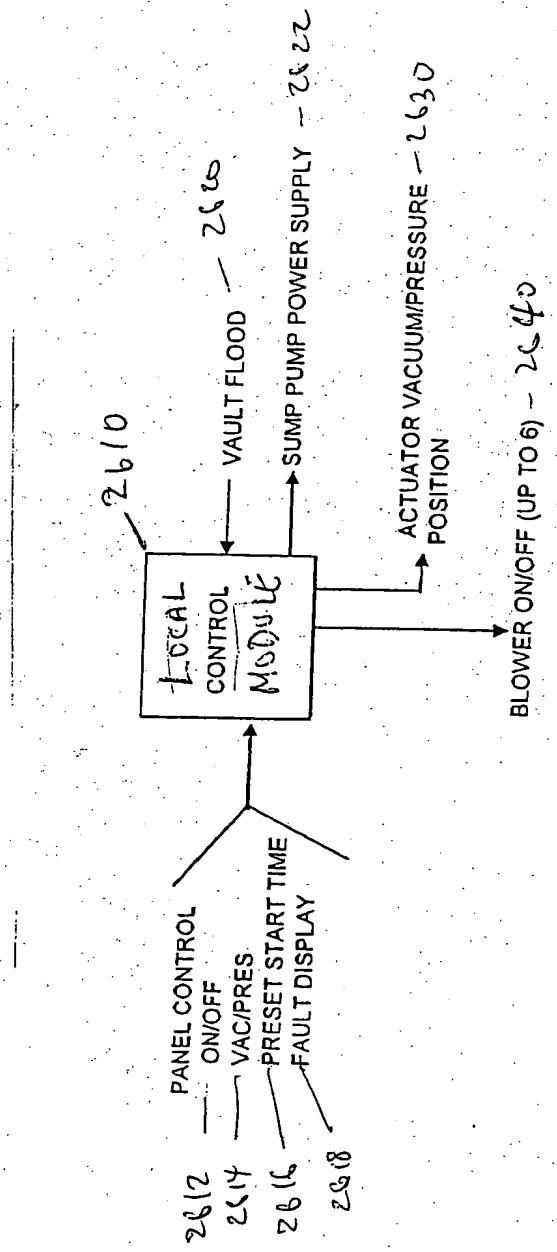

2610
LOCAL CONTROL MODULE
VAULT FLOOD — 2620
SUMP PUMP POWER SUPPLY — 2622
ACTUATOR VACUUM/PRESSURE — 2630
POSITION
BLOWER ON/OFF (UP TO 6) — 2640
PANEL CONTROL
ON/OFF
VAC/PRES
PRESET START TIME
FAULT DISPLAY
2612
2614
2616
2618

Fig. 26

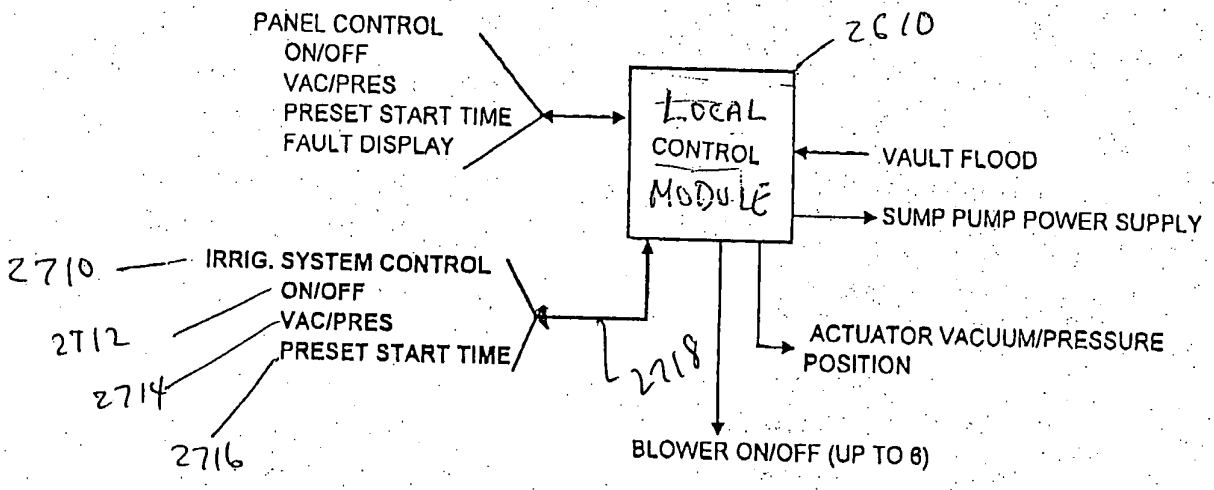


Fig. 27

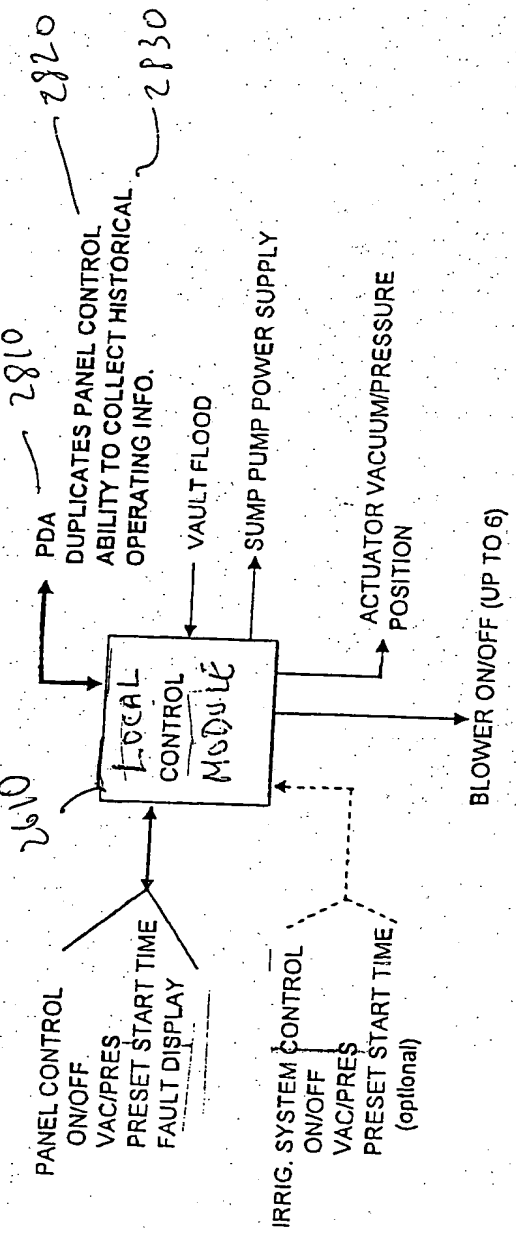

2820
2830
2810
PDA
DUPLICATES PANEL CONTROL
ABILITY TO COLLECT HISTORICAL
OPERATING INFO.
VAULT FLOOD
SUMP PUMP POWER SUPPLY
ACTUATOR VACUUM/PRESSURE
POSITION
BLOWER ON/OFF (UP TO 6)
2610
LOCAL
CONTROL
MODULE
PANEL CONTROL
ON/OFF
VAC/PRES
PRESET START TIME
FAULT DISPLAY
IRRIG. SYSTEM CONTROL
ON/OFF
VAC/PRES
PRESET START TIME
(optional)

Fig. 28

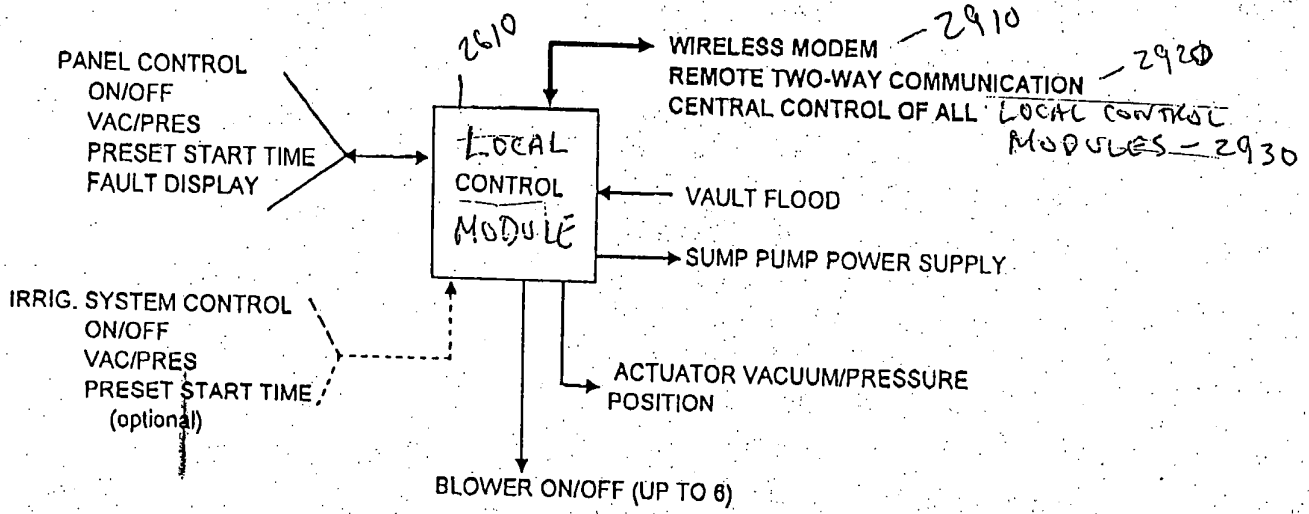


Fig. 29

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Atty. Joseph B. Milstein, Ph.D.
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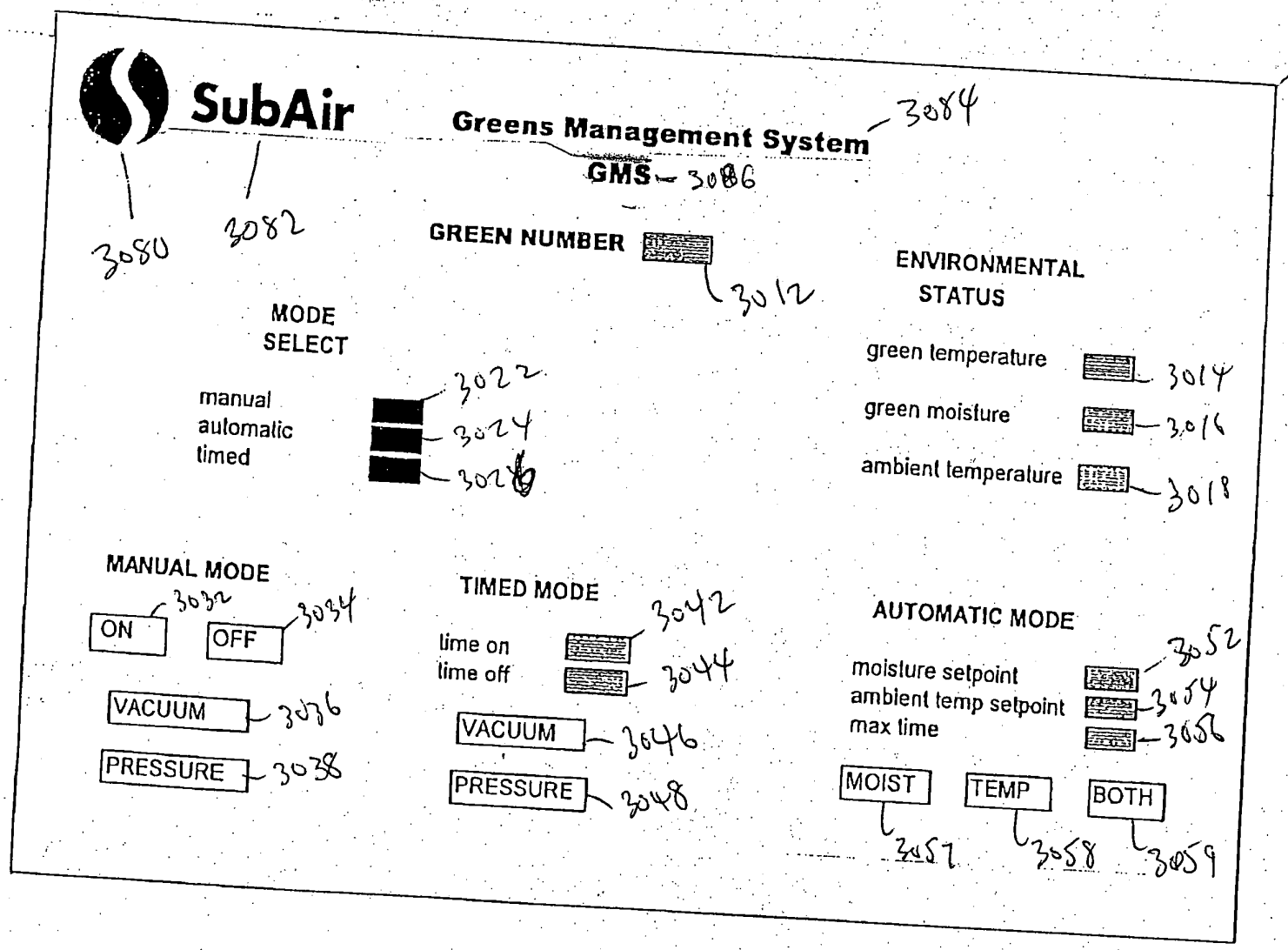
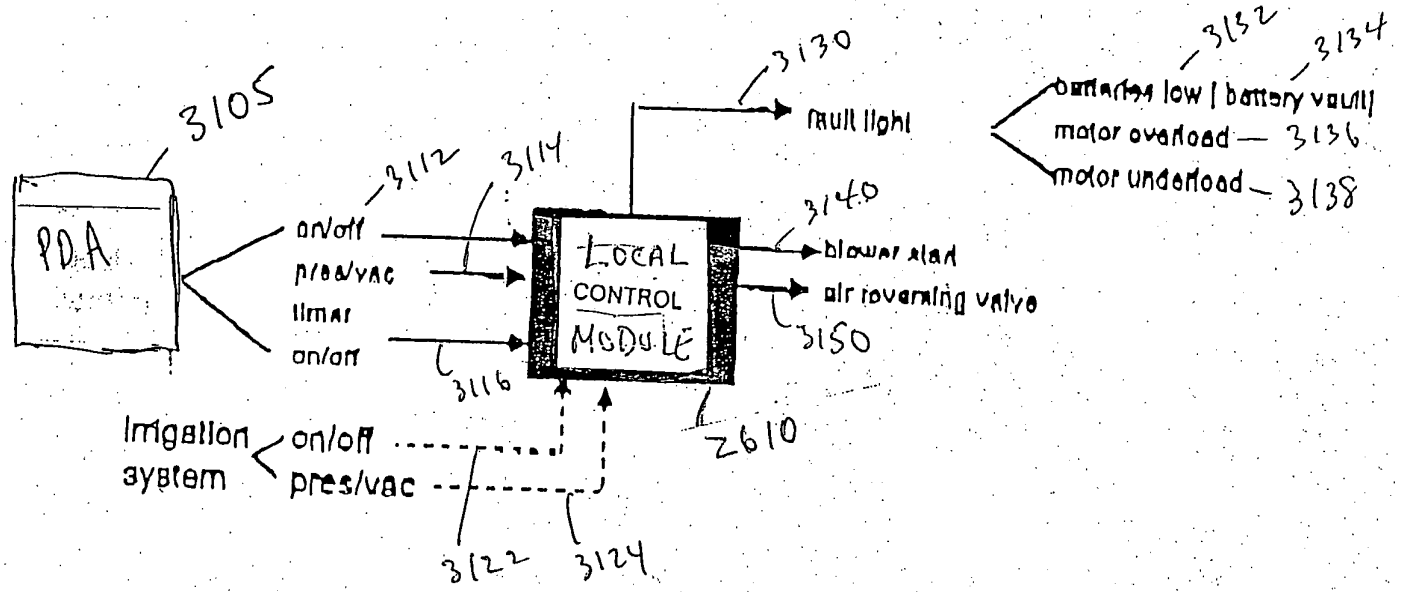


Fig. 30

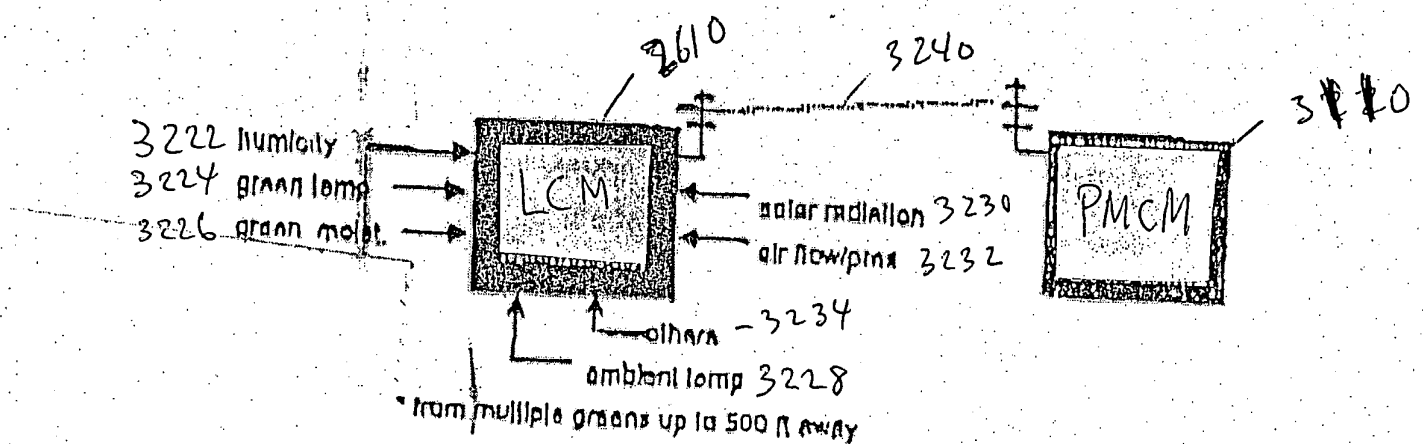
Fig. 31



FEATURES

- local control via PDA
- local display of faults
- time of day programmable start/stop
- auto start from Irrig. System

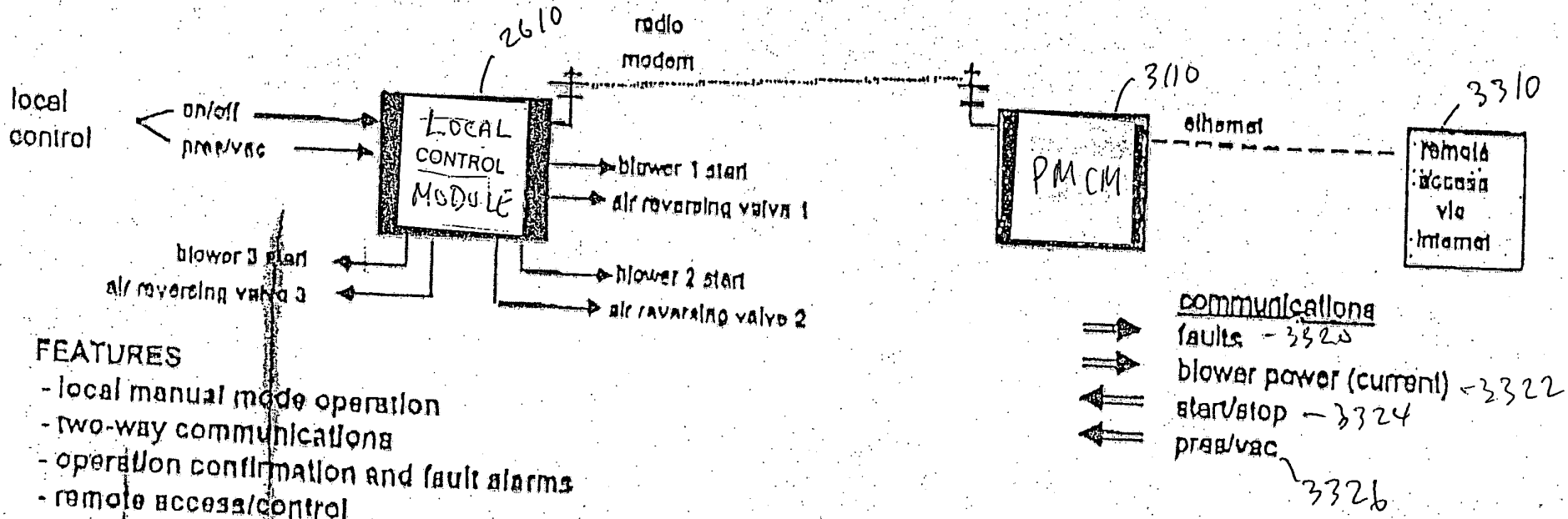
Environmental Monitoring and Control



FEATURES
- auto control programs based on temp & moist
- data-logging & trend charting history

Fig. 32

Network Communications



FEATURES
- local manual mode operation
- two-way communications
- operation confirmation and fault alarms
- remote access/control
- time of day programmable start/stop

Fig. 33

Equipment Panel

local disconnect (fused)
transformer (if 480 v supply)
motor contactor
motor overloads
current switch (contact close@ >2 amps)
relays: motor start
air reversing valve & actuator
<u>for one vault to two greens (double vault):</u>
diverter actuator - green A
diverter actuator - green B
panel door switch - on vacuum/ on pressure
panel door fault lite (overload/underload/flooded vault)

Field Devices

high pressure blower - 7.5 or 10 hp typically
[230 single or 230/460 three phase]
air reversing valve & actuator
2 - diverter valves & actuators (if double vault)
sump pump (if below ground)
float switch (indicates flooded below-ground vault)
moisture/temp sensor in green (if requested)
ambient air temp sensor (if requested)

Communication & Control

Outputs to panel
blower on
air reversing valve to pressure position (at rest is vacuum)
<u>for one vault to two greens:</u>
open diverter valve to Green A
open diverter valve to Green B

Inputs from panel & field devices
motor overloads dropped out
current <2 amps when running
vault flooded
green moisture
green temp
ambient temp
> if requested

Logic requirements
blower on based on - time of day
blower on based on - temp &/or moisture [if requested]
vacuum to green
pressure to green
green A &/or green B [if double vault]
shut down/do not start if vault flooded

Fig. 3A